

**Department of Veteran Affairs
Quality Enhancement Research Initiative (QUERI)**

**Stroke QUERI Center
Strategic Plan**



December 2008

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STROKE QUERI STRATEGIC PLAN 2008

Executive Summary

Overview

The mission of the VA HSR&D Stroke Quality Enhancement Research Initiative (QUERI) is to reduce the risk of stroke and to foster system, provider, and patient processes that result in the best possible outcomes for veterans with stroke. This mission is accomplished by focusing on three core clinical goals:

- Goal 1: Promote recommended **risk factor management** to reduce the risk of stroke
- Goal 2: Improve **in-hospital management** to reduce stroke morbidity and mortality
- Goal 3: Ensure that veterans with stroke receive appropriate and timely interventions to promote **rehabilitation and recovery**

To address these clinical goals, we employ cross-cutting methodological approaches including: healthcare system redesign, information technology (IT) interventions, and self-management strategies. We operationalize our mission via work conducted by three Workgroups: Risk Factor Management (Drs. Bosworth and Matchar, co-lead); In-hospital Management (Dr. Bravata, lead); Rehabilitation and Recovery (Drs. Chumbler and Williams, co-lead).

Accomplishments and Future Plans

The Stroke QUERI has successfully partnered with OQP and PCS to promote ongoing development and assessment of stroke performance measures. The earliest work took place in rehabilitation, with the development of the Functional Independence Measurement Performance Indicator for all hospitalized veterans with stroke, traumatic brain injury, or amputation. Recently, this measure has been transitioned to a Supporting Indicator due to overall consistently high level of performance; PCS/PM&R continue to track this indicator of consideration for needed rehabilitation services.

More recently, the Stroke QUERI has worked with OQP, PCS, ONS, and others to measure inpatient stroke care quality. This OQP Stroke Special Project is providing data about key evidence-practice gaps in risk factor management and inpatient stroke care. We continue to work with the above offices and with clinical leaders in the field to feedback stroke performance data to the field and to strategically plan our activities in response to these data. Our future plans are to repeat measurement with OQP in FY10 and to identify and promote the most appropriate of these indicators for ongoing stroke performance measurement.

We also continue to focus efforts on modification of stroke risk factors for primary and secondary stroke prevention. Work in this area has over time coalesced into our strategy to identify veterans at high risk for stroke, either first or recurrent stroke, and to develop IT tools and self management programs to improve care. We anticipate future risk factor management efforts to be shaped by OQP evidence-practice gap data, by the development of new evidence (e.g., THINRS trial), and by our partnerships with IHD/CHF QUERIs, OQP, and PCS.

Highlights of accomplishments and future plans are given below for each of our three clinical foci.

Stroke risk factor management. Beginning in FY07, the Stroke QUERI has directed significant energy and resources toward further defining and prioritizing our work in risk factor management. Our vision is to develop programs in primary and secondary prevention to: 1)

identify veterans at highest risk of stroke, and 2) provide effective risk factor management programs tailored to the veteran's individual stroke risk factors. In pursuit of this vision, we have used RRP to define current practices in risk factor education post-stroke and to understand how information about risk factors is communicated. In FY08 we initiated an RRP to examine the effectiveness of using administrative data to identify veterans at highest stroke risk (Cheng RRP). If successful, we plan to utilize this risk assessment method in a regional intervention to improve stroke risk factor management (primary prevention). Our RRP has led directly to two projects involving evaluation of self-management strategies: one to improve hypertension management (VSTITCH, primary prevention) and one addressing multiple stroke risk factors as veterans transition from hospital to home after stroke or TIA (TOOLS, secondary prevention). Finally, we have built on two pilot studies of evidence-based sleep apnea treatment in funding an IIR aimed at evaluating this intervention for improving blood pressure control and reducing recurrent event rates in patients with stroke and TIA. We plan to continue partnering with other QUERIs in cross-cutting risk factor issues including improving physical activity (DM, IHD QUERIs) and anticoagulation management (CHF, IHD QUERIs). Our ultimate aim is to combine programs proven effective (our work or others) to provide tailored management of multiple risk factors to reduce stroke risk.

In-hospital stroke management. One of our long-term goals has been to develop a stroke scorecard so that the quality of VA stroke care could be accurately assessed at a facility level over time. We began this effort in FY06 with initial discussion with OQP and conducted baseline assessment of national inpatient stroke care in FY07. In this project, we successfully partnered with OQP, PCS, ONS and others to plan, collect, and score data for 14 inpatient stroke quality metrics in 5,000 veterans with a VA stroke admission in FY07 (including metrics based closely on the 10 JC stroke quality indicators) and in FY08 presented these data nationally to CMOs and QMOs and to individual facilities. As a result of this effort, OQP is planning to repeat data collection in FY10. In support of this ongoing focus on inpatient stroke care processes, our CPRS-based SQUIDSS tool (in current development) will provide not only a reminder of best practices at the point of service but will allow for documentation and reporting on these key processes to facilitate efficient regional and national measurement and reporting of stroke care quality metrics.

Another key accomplishment in in-hospital management of stroke is our use of system redesign methodologies to promote quality improvement in stroke care. In FY07 we first employed these strategies in our dysphagia implementation project, resulting in the development of a Lean/System Redesign training program and improved dysphagia screening processes. We then used the training program as a foundation for our FY08 implementation project as we partnered with clinical teams at 7 VAMCs in VISN 11 to engage in stroke quality improvement efforts around two Joint Commission stroke quality metrics: dysphagia screening and discharge on lipid-lowering medication. Stroke QUERI implementation coordinators trained stroke champions at all 7 facilities on system redesign methods, collaboratively set future goals, and conducted ongoing facility team coaching to promote sustained improvement. Compared with the FY07 OQP data for VISN 11, June–September FY08 data demonstrated that dysphagia screening rates increased from 24% to 47% and discharge on lipid-lowering medication improved from 83% to 86%. In addition to fostering improvements in these two stroke quality indicators, the project also successfully developed and implemented a standard CPRS acute stroke order set at each VISN 11 facility. We are planning our FY09 implementation efforts around this methodology to promote successful implementation strategies while taking advantage of the planned FY10 remeasurement of inpatient stroke indicators as a means of conducting widespread evaluation of methods used to improve stroke care.

Stroke rehabilitation and recovery. Our aim in this domain is to improve access to post-stroke care that promotes optimal stroke recovery. As such, we are focusing on the area of access (via telehealth and cost-effectiveness of various systems of care) and post-stroke depression. Initial Stroke QUERI focus in improving stroke recovery (2004 and prior) included development and national implementation of a performance measure assessing whether rehabilitation was considered for all veterans admitted with stroke (the FIM performance measure). Due to continued high success in achieving this measure nationally, the FIM measure was transitioned to a supporting indicator in FY07. This measure continues to be monitored at the national level by OQP/PM&R.

Initial work in gap analysis and effectiveness studies in post-stroke depression led to an active implementation project employing a CPRS nurse and provider reminder to promote depression screening and treatment post-stroke. Preliminary data suggest that the PSD intervention has improved post-stroke depression screening rates; we expect complete data on this project in FY09 and plan a follow-up study to expand the use of this reminder in other settings.

We also used RRP funding in FY06 and 07 to develop telehealth dialogues related to rehabilitation and post-stroke care; this led to our ongoing project evaluating the use of existing IT tools to promote access and quality of rehabilitation post-stroke. Similarly, RRP funding in FY07 led to an ongoing project evaluating the cost and quality of different care delivery systems for providing post-stroke rehabilitation in the VA. We expect that these ongoing projects will lead to future work in the next 2-3 years focusing on implementing systems of care to provide best practices in and access to post-stroke rehabilitation in the VA.

SECTION 1: CENTER MISSION, GOALS AND SCOPE

1.1 Clinical Focus and Scope

Stroke encompasses multiple diagnoses, most commonly divided into hemorrhagic and ischemic stroke subtypes. Hemorrhagic stroke represents approximately 15% of all strokes in the U.S. and includes the major diagnoses of intracerebral hemorrhage and subarachnoid hemorrhage. Ischemic stroke represents approximately 85% of all strokes in the U.S. and as such is the stroke condition on which the VA Stroke QUERI is focused. *Broadly speaking, the Stroke QUERI is committed to improving care and outcomes for veterans at risk for ischemic stroke and those who have sustained an ischemic stroke.*

It is in the at-risk population that we have the greatest overlap with other QUERI centers who are addressing vascular risk factors. This overlap is most relevant for the Diabetes, Chronic Heart Failure and Ischemic Heart Disease QUERIs. In addition to our work in risk factor management for hypertension (primary and secondary prevention), and multiple risk factor interventions (secondary prevention), we partner with other QUERIs in projects focusing on improving management of common vascular risk factors including: physical activity (DM, IHD QUERIs) and anticoagulation for atrial fibrillation (IHD, CHF QUERIs).

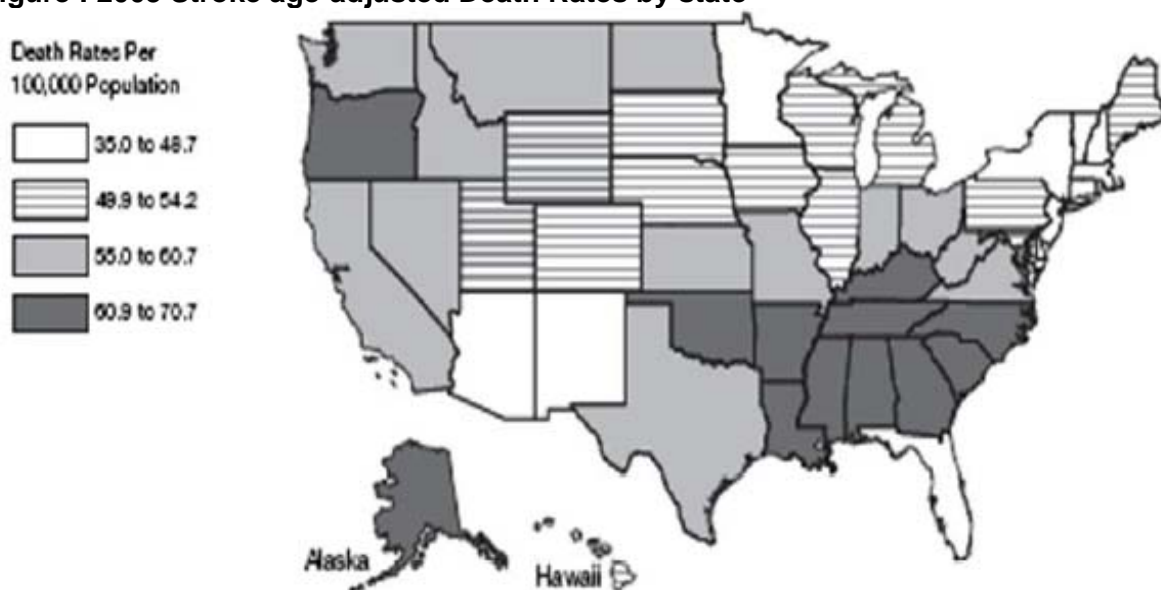
One of the challenges for the Stroke QUERI is the reality that stroke is a heterogeneous condition that includes the provision of care by many different types of providers (e.g., nurses, internists, neurologists, physiatrists, therapists) across many different practice settings (e.g., outpatient primary care, outpatient specialty care, inpatient, rehabilitation, long-term care). We also have the challenge of being a high impact, high acuity condition for which the volume and type of stroke cases varies substantially from one VA facility to another. The Stroke QUERI is committed to engaging across all aspects of the stroke care continuum from prevention to acute treatment to rehabilitation and recovery, but we recognize the need to focus our work to realistically set and accomplish goals and to most effectively meet the needs of VHA. Thus, within each of these three major areas and with ongoing explicit input from our Executive Committee, we have focused on specific clinical area(s), as supported by our assessment of the epidemiology, treatment evidence, and existing practices in these clinical areas. These major clinical foci include: treatment of hypertension, multiple risk factor interventions, inpatient stroke care processes, detection and treatment of post-stroke depression, and access to and cost of stroke rehabilitation.

1.2 Significance and Consequence: Epidemiology, Morbidity/Mortality, Quality of Life and Costs

Stroke Prevalence: Each year in the U.S., about 700,000 people experience a new or recurrent stroke.¹ Approximately 500,000 of these are first strokes, with 200,000 recurrent attacks.¹ Stroke prevalence increases with increasing age and among people with Black race/ethnicity. For example, the stroke prevalence among men aged 65-74 years is 6.7 per 1000 for Whites and 10.4 per 1000 for Blacks, but among men aged ≥85 years the rates are 16.8 per 1000 for Whites and 24.7 per 1000 for Blacks.¹

Mortality: Stroke is the third leading cause of death in the US. One in seven stroke survivors die within 6 months after their stroke, and more than half die within the first 5 years post-stroke.

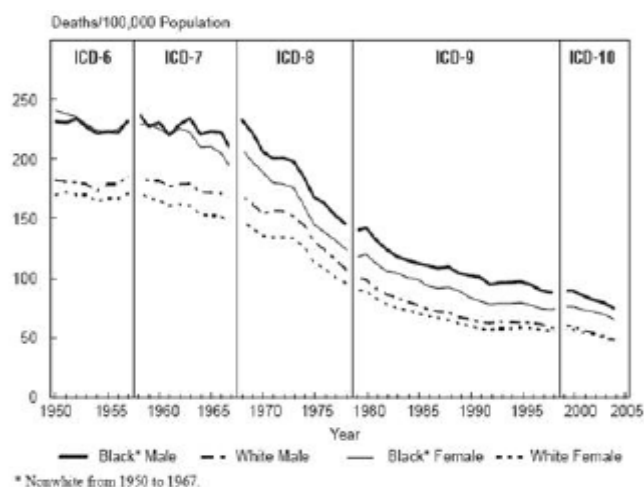
Figure : 2003 Stroke age-adjusted Death Rates by state



Geographic variation is known to exist in stroke mortality with the highest stroke mortality rates seen in the southeastern region of the United States (see map above).¹ Although the stroke mortality rates decreased considerably during the 1970s, this rate of decline has slowed substantially in recent years. Stroke mortality remains highest among Black males and Black females.²

Figure. Death Rates for Stroke by Race and Sex, U.S., 1950-2004

Morbidity: Stroke is a leading cause of serious, long-term disability in the U.S., with over 5.5 million Americans having survived a stroke.² Of these, more than 1.1 million American adults report difficulty with functional limitations or activities of daily living as a consequence of stroke.³ Among stroke survivors, 15-30% are permanently disabled,² with 20% requiring institutional care at 3 months after stroke onset.¹ Stroke is considered the leading cause of acute-onset adult disability, and often has persistent negative effects on quality of life of both patients and their family caregivers.³⁻⁵



Costs: The estimated direct and indirect cost of stroke in 2006 was \$57.9 billion, consisting of \$37.3 billion (64%) in health care expenditures, \$6.4 billion (11%) in lost productivity due to morbidity, and \$14.2 billion (25%) in lost productivity due to premature mortality.¹ At the individual level, mean lifetime direct cost of ischemic stroke in the U.S. is \$140,048. Stroke costs increase with increasing stroke severity such that the average cost for the first 30 days post-stroke was \$13,019 for mild ischemic strokes and \$20,346 for severe ischemic strokes.¹ Evidence suggests that the cost burden falls disproportionately on minorities.

Stroke in the VA System: Within the VA, approximately 17,000 patients were treated for stroke during FY05. Data from our OQP Stroke Special Project suggest that in FY07, nearly 6,000 veterans were admitted to a VA facility with a primary discharge diagnosis of ischemic stroke. Given that this cohort excluded admissions for rehabilitation care, excluded patients with in-hospital stroke, and excluded patients with stroke and concomitant medical illness where the stroke was coded secondary to the medical illness (e.g., stroke in the setting of acute myocardial infarction), this figure of nearly 6,000 veterans is an underestimate of the actual number of annual ischemic stroke admissions within VHA. One year post-stroke mortality for VA inpatients is approximately 20%; and 30% of veterans with stroke are discharged to non-community, institutional settings.⁵ The total VA cost of stroke treatment was almost \$315 million in FY05, with a cost per patient of over \$18,000. The importance of stroke within the VA is emphasized by the fact that stroke patients account for over 10 percent of the VA's complex caseload, with a cost per patient that is over 3.4 times the overall VA average.⁴

Veterans are at increased risk of stroke because three of the most important stroke risk factors are common among the veteran population: older age; hypertension; and atrial fibrillation. Hypertension affects more than 8.5 million veterans, and approximately 220,000 veterans have atrial fibrillation (2004 VHA Medical Inpatient datasets, both Acute Inpatient Main and Extended Care Main files, and VHA Medical Outpatient dataset).

Variation in Stroke Care Quality: Despite advances in the prevention and acute management of stroke, many patients do not receive high quality care. Wide variation in acute stroke care exists including under-use of established therapies (e.g., antiplatelet agents, anticoagulation for atrial fibrillation), over-use of unproved therapies (e.g., intravenous anticoagulation), and misuse of therapies (e.g., errors in the administration of thrombolytic therapy).⁶⁻⁹ In FY09 the Stroke QUERI will report national VA acute stroke care quality metrics as well as performance on pre- and post-stroke risk factor management in 5,000 veterans admitted to the VA with stroke in FY07. Despite successful implementation of stroke care quality improvement programs at many individual facilities, stroke care quality has not been improving substantially for the nation. For example, among Medicare beneficiaries only 55% of ideal candidates received warfarin for atrial fibrillation during 1998-1999 and this rate increased only modestly to 57% in 2000-2001.⁷ Similarly, among the U.S. academic medical facilities in the University Healthsystem Consortium, only 45% of stroke patients received screening for dysphagia prior to oral intake in 1999; this rate fell to 35% in 2001, and was 38% in 2005.¹⁰ The Paul Coverdell Stroke Registry, a national sample of acute stroke admissions, found that although 92% of patients received antithrombotic therapy at discharge, only 45% of eligible patients were screened for dysphagia, 34% had lipid evaluation, and 21% received counseling for smoking cessation.¹¹

1.3 Treatment/Management Evidence Base

Selected examples of the evidence guiding the Stroke QUERI scope of work are included below. We have focused on evidence pertaining to our key areas of focus: hypertension, multiple risk factor management, and atrial fibrillation; inpatient care quality; post-stroke depression, and stroke rehabilitation access and cost. Relevant guidelines referencing these examples are given in Section 1.5. The examples of the evidence are organized around the framework of the three Stroke QUERI clinical goals.

Clinical Goal No. 1: Promote recommended risk factor management to reduce the risk of stroke

Hypertension Management: Compelling evidence for more than 30 years has demonstrated that the control of high blood pressure contributes to the primary and secondary prevention of stroke.¹²⁻¹⁵ Hypertension has been identified as the risk factor with highest population attributable risk for stroke, representing the primary cause in over 50% of all ischemic strokes.¹⁶ Overall, antihypertensive therapy is associated with a 30% to 40% reduction in the incidence of stroke.¹⁷ Numerous studies, conducted in a variety of settings, have demonstrated that a decrease of 10 mm Hg in systolic blood pressure is associated with a 30% decrease in the relative risk of stroke.¹⁸⁻²⁰

Multiple risk factor interventions: Most patients with stroke have more than one vascular risk factor. Data from a national sample of 55,000 veterans with stroke from FY 1991 to 1997 showed that 56% had hypertension, 28% had diabetes, 8% had hyperlipidemia and 10% had atrial fibrillation.²¹ We are currently analyzing the OQP data to assess the patterns of risk factors observed in veterans admitted with stroke in FY07. Although evaluation of treatment of a single risk factor may be scientifically advantageous, the reality for veterans is they have multiple risk factors to manage, necessitating guideline-adherent prescribing, ongoing monitoring, behavior change, self management, and communication with health care providers. For this reason, the Stroke QUERI is working to develop effective methods of identifying veterans at high risk of stroke, communicating stroke risk to patients, promoting best practices among providers, and evaluating self management interventions to improve risk factor management pre-and post-stroke.

Atrial Fibrillation Management: Atrial fibrillation is an increasingly common, potent, and yet modifiable risk factor for stroke. Multiple clinical trials have demonstrated the superiority of warfarin compared with placebo in the prevention of thromboembolic events among patients with nonvalvular AF. Pooled data from 5 primary prevention trials of warfarin versus control have been reported.²² The efficacy of warfarin has been shown to be consistent across studies, with an overall relative risk (RR) reduction of 68% (95% CI, 50 to 79) and an absolute reduction in annual stroke rate from 4.5% for the control patients to 1.4% in patients assigned to adjusted-dose warfarin. This absolute risk reduction indicates that 31 ischemic strokes will be prevented each year for every 1000 patients treated. The risk reduction for both primary and secondary prevention is similar.²³ Overall, warfarin use has been shown to be relatively safe, with an annual rate of major bleeding of 1.3% for patients on warfarin compared with 1% for patients on placebo or aspirin. The optimal intensity of oral anticoagulation for stroke prevention in patients with AF is an International Normalized Ratio, 2.0 to 3.0. Recent data from the VA Cooperative Study THINRS trial demonstrated that home INR monitoring with point-of-care devices may be an alternative to conventional anticoagulation management for veterans on warfarin. (AHA Scientific Sessions presentation November 2008).

Clinical Goal No. 2: Improve in-hospital management to reduce stroke morbidity and mortality

Evidence-based inpatient stroke care encompasses acute treatment with thrombolytics, treatments to prevent complications, and initiation of appropriate measures to reduce the risk of recurrent stroke. The 10 stroke quality indicators currently endorsed by the Joint Commission and other national groups as representing quality stroke care, and used in their Primary Stroke

Center certification program, are given in the table. Although a review of the evidence behind each of these indicators is beyond the scope of this plan, we choose to focus our inpatient quality improvement efforts on the indicators that: 1) have a documented performance gap, 2) that are applicable to the largest number of veterans with stroke, and 3) that have the best evidence in support of their link to important stroke outcomes. Indicators that have been a focus of active implementation projects or are part of planned upcoming projects are noted in the table. We will continue to use the OQP FY07 data to guide the focus of our inpatient stroke quality improvement interventions. For example, if the OQP data suggests a significant gap in receipt of tPA by eligible veterans with stroke, we will plan future projects and activities accordingly.

Harmonized JC Inpatient Stroke Quality Indicators*	Focus of QUERI project
Thrombolytic Therapy Administered to Eligible Patients	
Deep Vein Thrombosis (DVT) Prophylaxis	
Dysphagia Screening Before Oral Intake	A
Antithrombotic by Hospital Day 2	
Assessed for Rehabilitation	
Discharged on Antithrombotic Therapy	
Patients with Atrial Fibrillation Receiving Anticoagulation	P
Discharge on Cholesterol Reducing Medication	A
Smoking Cessation Counseling	A
Stroke Education	A

A = active project, P = planned project, *Note: all of these measures were included in the OQP Stroke Special Project

Coordinated Inpatient Stroke Care: A meta-analysis of randomized controlled trials of organized inpatient stroke units found that stroke units were associated with a 17% reduction in one-year mortality (OR 0.83; 95% CI 0.69-0.98) and 25% reduction in the combined endpoint of death or institutionalization (OR 0.75; 95% CI 0.65-0.87).^{24,25} This benefit of stroke units is not likely due to differences in patient characteristics between stroke units and general wards because the trials were randomized. In addition, many of the observational studies demonstrated that patients were similar with respect to their baseline characteristics. A Dutch study found that composite team functioning was instrumental in quality of care improvements in stroke (primary outcome reducing length of stay).²⁶ Another study of stroke units documented a number needed to treat (care in stroke unit) to prevent one death is only 5 for 30 day mortality and 6 for 1-year mortality.²⁷ Much of the data reflecting the benefits of stroke units is largely based on European style multidisciplinary combined acute-rehabilitation units and may not reflect the current practices within the typical US stroke unit which is focused on acute care with a much shorter length of stay. VA is evaluating the structure of inpatient stroke care across the VA in a national FY08 IG survey; we plan to utilize these data in conjunction with our OQP stroke quality data to determine the association between structures of care and stroke care quality in VA facilities.

Clinical Goal No. 3: Ensure that veterans with stroke receive appropriate and timely interventions to promote rehabilitation and recovery

Access to Post-stroke Rehabilitation: Adherence to the VA/DOD post-acute stroke guidelines are associated with improved functional recovery, community rehabilitation discharge, and patient satisfaction. Specifically, increasing guideline adherence from 50% to 75% could increase Functional Independence Measure (FIM) motor score at rehabilitation

discharge by 4 FIM points and increasing adherence by 10 points is associated with a 1.4 odds ratio for being discharged to the community.²⁸ Our ongoing telehealth stroke rehabilitation project is examining whether telehealth devices can improve adherence to post-stroke rehabilitation recommendations and patient function post-stroke. Our ongoing rehabilitation cost-effectiveness and modeling studies are examining how the structure of rehabilitation care is associated with both cost and quality of post-stroke rehabilitation.

Post-stroke depression (PSD): Using VHA inpatient/outpatient administrative databases, it is estimated that between 30% to 57% of individuals post-stroke have depression. PSD is associated with worse functional outcomes, lowered quality of life and increased post-stroke mortality. Our prior work has demonstrated that these effects are present in veterans with stroke and we found that those with a new depression diagnosis post-stroke had a 25% increase in mortality and health care utilization post-stroke.^{29,30} We have also recently shown that for veterans receiving only VHA care post-stroke there is no geographic variation in depression diagnosis, but among dual-users of VHA and Medicare post-stroke care, veterans in the Southeast, Mideast, and Far West regions are less likely to be diagnosed with depression.³¹

Current VA/DoD and ASA guidelines recommend screening for depression post-stroke. Although many existing depression screeners have been shown to be valid in assessing depression post-stroke, we documented that the PHQ-9 and PHQ-2, commonly used for depression screening in VA Primary Care clinics, are valid assessments of post-stroke depression.³² Several small clinical trials have suggested that treatment with an antidepressant can improve depression symptoms in patients with post-stroke depression, and we recently completed a five-year multi-site randomized trial of depression care management demonstrating that guideline-adherent depression care resulted in significantly more depression remission than usual care after stroke.³³ Our ongoing implementation study is evaluating whether a CPRS-based depression screening and treatment reminder is more effective than usual care in improving depression detection and treatment in the first six months post-stroke.

Emerging and/or Controversial Evidence

In addition to the evidence detailed above, some other aspects of stroke care reflect new emerging and/or controversial evidence related to ischemic stroke treatment or prevention, or represent areas with a strong evidence base that we are currently examining for evidence-practice gaps in the OQP FY07 data. Among this broad group of possible additional areas of stroke care worthy of mention, we focus on those with the most robust evidence and/or current investigation including: 1) extending the time window for receipt of thrombolysis, 2) evidence for the use of specific rehabilitation modalities (e.g. robot-assisted therapy), 3) treatment of symptomatic and asymptomatic carotid stenosis, and 4) management of transient ischemic attack (TIA).

Intravenous Thrombolytic Therapy: Intravenous thrombolysis with tPA remains the only FDA-approved medical therapy for acute ischemic stroke. The use of intravenous thrombolysis with tissue plasminogen activator (tPA) given within 3 hours of stroke symptom onset is associated with an increased proportion of patients with a favorable stroke outcome.^{34,35} For example, for patients treated within 90 minutes of stroke symptom onset the odds ratio of a favorable outcome at 3 months was 2.11 (95%CI 1.33-3.55) whereas the odds ratio was 1.69 (95%CI 1.09-2.62) if the tPA was given 90-180 minutes after symptom onset.³⁶ Several studies have demonstrated that the risks of tPA associated complications (e.g., intracranial hemorrhage)

increases with the degree to which the guidelines are not followed.^{37,38} Recent data from a large randomized trial in Europe suggest that the time window for safe and effective tPA use may be extended to 4.5 hours post-stroke. Although these data have not yet been incorporated into existing acute stroke guidelines, we will evaluate the impact this potential change in the time window for intravenous tPA would have on the number of veterans eligible for tPA in our OQP stroke dataset.

Rehabilitation Modalities: Evidence continues to emerge for three specific stroke rehabilitation modalities. We will continue to monitor evidence in these areas as it emerges. First, in recent years there have been several studies that have investigated the effects of robot-assisted therapy on motor and functional recovery in patients with stroke. A meta-analysis of ten studies involving 218 patients found no overall significant effect in favor of robot-assisted therapy, primarily due to marked heterogeneity in studies between distal and proximal arm robotics.³⁹ Likewise a Cochrane review reported that electromechanical-assist (robotic) devices with usual physical therapy may be superior to usual therapy alone in promoting independent walking in patients initially non-ambulatory post-stroke, but questions about patient selection, dose, and duration of therapy remain.⁴⁰ An ongoing randomized controlled trial funded jointly by VA Cooperative Studies and Rehabilitation Research and Development Services (CSP 558) has been designed to address some of the methodological concerns present in the prior robot-assisted therapy trials and will compare motor and functional outcomes among post-stroke patients who are randomly assigned to one of three treatment arms: intensive conventional therapy, robot-assisted therapy and usual care. We expect results in FY09 for this trial.

The two other specific therapies with growing evidence supporting their use are constraint-induced movement therapy (CIMT), which forces the use of the affected limb in post-stroke hemiparesis by immobilizing the unaffected arm, and locomotor training with body weight-supported treadmill. A recent multi-site randomized trial has shown that ischemic stroke survivors receiving CIMT compared to usual therapy had significant and sustained improvement in upper extremity function in the first 9 months post-stroke,⁴¹ but questions about patient selection, dose, and duration of therapy remain; at least one preliminary study demonstrated that very early initiation of this therapy may be harmful.⁴² Locomotor training vs. usual physical therapy is the subject of an ongoing NIH-funded randomized, controlled trial; we will continue to monitor developments in this trial (Dr. Duncan, Stroke QUERI Executive Committee member is PI).

Carotid Artery Stenting: Carotid artery stenting (CAS) was approved in 2004 by the FDA for the treatment of carotid stenosis in high risk patients, largely based on the results of one RCT demonstrating non-inferiority of CAS.⁴³ Despite the fact that CAS procedures are increasing rapidly, studies continue to raise questions about the risk-benefit ratio for CAS and how to appropriately define the “high risk” for CEA population.⁴⁴⁻⁴⁹ One major ongoing trial in this area is the Carotid Revascularization Endarterectomy Versus Stenting Trial (CREST).⁵⁰ The Centers for Medicare and Medicaid Services (CMS) recently declined to expand coverage of stenting for asymptomatic patients. CMS does cover stenting for patients with high-grade symptomatic stenosis who are at high risk for CEA. Recognizing this area of controversy, the Stroke QUERI plans to assess the use of carotid stenting and CEA in our OQP Stroke Special Project.

Asymptomatic Carotid Stenosis: Another area of controversy in management of carotid stenosis is in the management of the asymptomatic patient. A large randomized controlled trial suggested small but significant benefit for surgical versus medical management of carotid stenosis in asymptomatic persons with greater than 60% carotid stenosis.⁵¹ Due to the small margin of benefit and the requirement for very low surgical morbidity and mortality to realize

even these modest benefits, many clinicians are recommending surgery for asymptomatic stenosis only when the degree of stenosis increases (e.g. to 80% stenosis). This clinical rationale is based on the observation of increased stroke risk as asymptomatic carotid stenosis increases. Others are raising the question of surgical benefit compared to current best medical therapy.⁵² Current VA practices in the management of asymptomatic carotid stenosis are unknown.

Transient Ischemic Attack (TIA): Annually in the United States, 200,000 to 500,000 transient ischemic attacks come to medical attention.⁵³⁻⁵⁵ Nearly 15% of all strokes are heralded by a TIA.¹ Approximately 30-50% of TIAs according to the classic definition (focal neurological deficits resolving within 24 hours), would be considered infarctions on the basis of diffusion-weighted magnetic resonance imaging findings.⁵⁶ Despite currently available secondary prevention strategies, at least 17% of TIA patients have a stroke in the 90 days after the TIA.⁵⁷⁻⁵⁹ Approximately 25% of TIA patients have a recurrent TIA, stroke, cardiovascular hospitalization or death in the 90 days after the TIA.⁵⁷ Recent data suggest that rapid evaluation after TIA is associated with decreased risk of stroke, and various algorithms for risk-stratifying TIAs have been developed from retrospective cohort data.^{60,61} In the OQP dataset we will evaluate TIA management in the VA for veterans with TIA within 8 weeks prior to stroke. However, since the OQP cohort consists only of patients with stroke, we cannot assess the association between the evaluation of TIA and subsequent stroke risk.

1.4 Current Practices and Quality/Outcome Gaps

The Stroke QUERI, our research partners, and other VA researchers have documented significant evidence-practice gaps in stroke risk factor management and stroke care quality. Initial data on inpatient stroke quality indicators from our OQP Stroke Special project will be available early in FY09 once data have been corrected by facilities and cleared for release by OQP. As detailed below, we anticipate collecting additional important and comprehensive data about these inpatient practices and other gaps in VA outpatient stroke risk factor management as we further analyze OQP data in FY09.

Hypertension Management: In the VA, there is substantial variability in blood pressure control. Several VA studies have documented that only 25% - 40% of hypertensive patients had their blood pressure under control (<140/90 mm/Hg).^{7, 24-26} Data from VISN 11 indicated that only 26% of veterans with stroke met the established VA performance criteria for hypertension management of having at least 75% of blood pressure measurements at or below goal.⁶² A study of veterans undergoing either carotid endarterectomy, coronary artery bypass grafting, or percutaneous coronary intervention at 5 Veterans Administration Healthcare Systems evaluated guideline-recommended control of blood pressure in 12-month periods before and after a vascular procedure. Compared with the carotid endarterectomy group, the percutaneous coronary intervention group was more likely to achieve optimal control of blood pressure (OR: 1.92, 95% CI: 1.42 to 2.59) and the coronary artery bypass graft group was more likely to achieve optimal control of blood pressure (OR: 1.53, 95% CI: 1.42 to 2.59).⁶³ In FY09, we will analyze OQP outpatient data to assess blood pressure control pre- and post-stroke.

Atrial Fibrillation Management: Using VA administrative databases, QUERI investigators determined the impact of warfarin for secondary prevention of mortality and morbidity among stroke patients with atrial fibrillation (AF). A retrospective observational cohort of individuals with stroke and atrial fibrillation found that 40% of patients had received outpatient warfarin

therapy within 4 weeks of the stroke admission date. Controlling for age and co-morbidities, warfarin was associated with significantly improved survival over a 2 year period following stroke (Hazard Ratio: 0.568, 95% CI: 0.445-0.724) (R Beyth, unpublished). In a separate study, utilizing FY03 data from the Decision Support System lab data, QUERI investigators determined that anticoagulated patients with stroke and AF are in a therapeutic range (International Normalized Ratio, 2-3) approximately 50% of the time (Dr. R Beyth, unpublished). In FY09, we will analyze OQP outpatient data to assess initiation of anticoagulation for patients with atrial fibrillation and stroke, as well as atrial fibrillation management pre- and post-stroke. The recently completed VA Cooperative Study THINRS trial (D. Matchar, Stroke QUERI Executive Committee Chair, PI), showed that point-of-care testing devices may be a reasonable alternative to traditional laboratory monitoring for outpatient warfarin management.

Intravenous Thrombolytic Therapy: A review of 1487 stroke and TIA patients at 3 VA medical facilities and 2 non-VA facilities (QUEST, unpublished data) found that thrombolytic therapy with tPA was being used in two of the three VA centers and that the rates of major protocol violations were comparable between VA (25%) and non-VA facilities (28%). Although initial rates of thrombolysis for eligible patients in OQP data appear low, we expect that this estimate may change as facilities have the opportunity to examine their data and correct fall outs, since much of the documentation around decisions to give tPA in stroke may be in paper records not available to OQP chart abstractors.

Coordinated In-Patient Stroke Care: A survey of VISN 11 demonstrated that none of the medical facilities in that VISN have a coordinated in-patient stroke service. In FY09 we anticipate the results of an OIG survey of all facilities on the organization of stroke care in VA.

Post-stroke Rehabilitation: Stroke patients should receive an assessment of functional status (using the Functional Independence Measure [FIM]); this assessment was a core performance measure for VAMCs and is currently a supporting indicator. Stroke QUERI investigators have found that 88% of stroke patients received a FIM in FY06 but that this assessment rate decreased to 84% in FY07. Again, wide geographic variation exists with the VISN assessment rate ranging from a low of 68% (VISN 2) to a high of 92% (VISN 3).

Stroke QUERI investigators reviewed the use of rehabilitation services nation-wide and found that by the end of FY07, 30% of all stroke patients in the moderate impairment groups (Functional Related Groups 4-7) are receiving intensive rehabilitation services. Over the course of one year (since EOY06), the total percentage has increased from 22% to 30%. Wide variation exists across VISNs, from a low of 13% (VISN 9) to a high of 48% (VISN 20). In collaboration with Physical Medicine and Rehabilitation Service, Stroke QUERI investigators used the Integrated Stroke Outcomes Data Base (FY03), to analyze access to inpatient and outpatient rehabilitation care for individuals with moderate stroke (FRG 4-7). Our results demonstrated that access to intensive rehabilitation bed unit care varied across VISNs from 9% to 60%. Prior work in the VA Stroke Study (VAST) demonstrated 2-year post-stroke fracture risk of 5-6% and identified this group with moderate impairment as having the highest risk for subsequent fracture.⁶⁴ However it is not known if access to rehabilitation services would decrease the fracture risk.

Other prior work in the VAST Study documented that although minority veterans experienced neither overall delay in referral for rehabilitation nor decreased receipt of services compared to whites, among those with delay in referral African American veterans had a worse recovery trajectory in the first year post-stroke.⁶⁵ Ongoing Stroke QUERI projects are examining the

impact of telerehabilitation as a way to improve access to rehabilitation and are assessing the cost effectiveness of different structures for providing post-stroke rehabilitation in VA.

Post-stroke Depression (PSD): Considerable variation has been documented in non-stroke-related depression screening and follow-up in the VA.⁶⁶ Although annual screening rates are high and have been increasing with ongoing performance feedback, follow-up within six weeks of a positive screen (a recommended performance measure) occurs much less often. A study in 14 VHA hospitals in the Northeast demonstrated that although adequate antidepressant dosage was achieved in 90% of patients with a major depression diagnosis only 45% had adequate duration of treatment, with younger age, African American veterans, and treatment exclusively in primary care associated with inadequate depression care.⁶⁶ Interestingly, overall facility performance scores for continuous quality improvement were not associated with adequate dose or duration of depression treatment in this study, suggesting that disease-specific quality improvement activities may be needed.⁶⁷

Gaps also exist and are likely magnified in the detection and treatment of PSD compared to non-stroke-related depression. Studies done in the Stroke QUERI have shown:

- Depression was diagnosed in only 27% of veterans in the first three year after stroke, even when outpatient diagnoses and written physician notes were examined.⁶⁸
- PSD is under-treated, with 20% of patients prescribed an antidepressant after stroke receiving only a single prescription.⁶⁹
- Only 1/3 of veterans with recent stroke are screened for depression in primary care during the six months immediately post-stroke. This “accidental” screening occurs only if the annual depression performance measure was due at that visit and is not targeted specifically to this high-risk group of veterans (PSD Implementation Study, unpublished data).
- PSD diagnosis varies by region when diagnosis in both VA and non-VA settings are considered.⁷⁰

1.5 Significant Influences on Current Practices and Outcomes

VA Influences on Stroke Care: The VA does not currently monitor any stroke specific performance measures. The former rehabilitation measure requiring assessment of the FIM during hospitalization in all stroke, traumatic brain injury (TBI) and amputee patients has recently been converted to a supporting indicator. Performance on this measure for stroke patients improved from 65% of all stroke patients in VA at the time of establishment of this measure in FY03 to 88% in FY06. In FY07, after conversion to a supporting indicator, performance dropped to 83%; ongoing monitoring will assess whether successful rates of performance on this important rehabilitation measure are maintained.

In addition to the FIM supporting indicator, there are several relevant EPRP Primary Care performance measures related to management of stroke risk factors or complications (e.g., LDL at goal, Hgb A1c at goal, blood pressure at goal, smoking cessation and annual screening for depression). To date, we are not aware of programs to target stroke survivors or veterans at especially high risk of stroke for these measures, except for our ongoing implementation project to modify the existing depression annual screening tool to screen and treat veterans with PSD.

One of the Stroke QUERI's key strategic plans in FY07 was to promote the development of a VA stroke "scorecard." Our strategic partnership with OQP has led to the development of the OQP Stroke Special Project, begun during FY07 and to be completed in FY09. This project will be crucial in demonstrating current performance on JC stroke performance measures across all VA facilities, identifying current evidence-practice gaps in VA stroke care, and suggesting key areas for prioritization of QUERI implementation activities. In early FY09 we will feed back JC performance measures to all facilities and identify key candidate measures for ongoing stroke performance assessment. OQP has committed to remeasurement of these indicators in FY10.

Also in FY07, VHA convened a group including neurology, internal medicine, cardiology, emergency medicine, nursing, and other providers to develop guidelines for acute stroke treatment (Dr. Kent, Stroke QUERI Executive Committee member, was clinical champion for this effort); this guideline is currently in review by the Medical Advisory Panel. The confluence of this guideline release and inpatient stroke performance data from our OQP Stroke Special Project will likely be important new influences on VA stroke care. Further, the Brain Attack Coalition/NINDS is currently updating the document that is the basis for Primary Stroke Center (PSC) certification; we will evaluate this document when available in light of current and planned VA activities.

External Influences on Stroke Care: Several important national initiatives have resulted in the development of tools to both enhance and evaluate the quality of stroke care. The program that most influences current stroke care was developed by one of the VA Stroke QUERI's strategic stakeholders, the American Stroke Association (ASA), a division of the American Heart Association, in partnership with the Joint Commission. Based on recommendations from an ASA task force and the Brain Attack Coalition,^{71,72} the ASA and the JC established assessment and credentialing for primary stroke center (PSC) status.⁷³ This credentialing evaluates key structure and process elements and includes the implementation of quality improvement systems as a necessary component for PSC status. Some states have enacted legislation requiring persons with suspected stroke be preferentially transported to a stroke certified hospital; this has stimulated some VAMCs to seek state-based or JC certification. As of November 2008, there were 505 JC certified PSCs nationwide.⁷⁴ and more than 200 state designated stroke facilities (personal communication, Dennis Milne, American Stroke Association). We are aware of at least 3 VAMCS who have completed or are pursuing JC Primary Stroke Center Certification (Bay Pines, Houston, Miami).

The ASA also developed a hospital-based quality improvement program for cardiac and stroke patients, "Get With The Guidelines" (GWTG).⁷⁵ Topics covered include heart failure, CAD, and stroke. This program, which received the 2004 Innovation in Prevention Award, includes tools to evaluate the quality of acute stroke treatment delivery, initiate stroke guideline recommended therapies, and deliver patient education at the teachable moment immediately after an acute stroke event, primarily at the point of discharge. As of November 2008, there are 1,223 facilities with GWTG-Stroke signed stroke contracts. The GWTG program requires the transmission of data from the VA to a civilian, commercial data depot for benchmarking. Currently, we are aware of 3 VAMCs that are participating in the GWTG program (Bay Pines, Cincinnati, Miami). As we work with VA facilities during the feedback of inpatient stroke performance measures from the OQP Stroke Special Project and in the SQUINT network, it is possible that GWTG and/or PSC certification will be a potential mechanism some VA facilities may find useful in working to improve their stroke care.

Other external influences that can potentially inform our work within the VHA include national stroke policy documents developed by England and Canada.^{76,77} These strategies for

organized systems of care include explicit components of care as well as performance metrics, and serve as potentially important external benchmarks for the VHA to consider in developing and monitoring the quality of VA stroke care.

Guidelines Related to the Care of Veterans with Stroke or TIA: The mission of the Stroke QUERI is guided by the evidence-based guidelines developed by the Veterans Health Administration, the Department of Defense, and the American Heart Association/American Stroke Association. We review the literature regularly for updates to these guidelines, and with the help of the ASA identify guidelines in the process of modification based on emerging evidence. These guidelines include evidence based recommendations for care of stroke patients across the care continuum. The specific guidelines that form the foundation of the evidence base for the Stroke QUERI's mission and goals are as follows:

1. Veterans Administration/Department of Defense Clinical Practice Guideline for the Management of Adult Stroke Rehabilitation Care⁷⁸
2. Management of Adult Stroke Rehabilitation Care⁷⁹
3. Guidelines for the Prevention of Stroke in Patients with Ischemic Stroke or Transient Ischemic Stroke^{17,80}
4. Guidelines for the Early Management of Adults with ischemic Stroke³⁴
5. Coronary Risk Evaluation in Patients with Transient Ischemic Attack and Ischemic Stroke⁸¹
6. Primary Prevention of Ischemic Stroke⁸²
7. Physical Activity and Exercise Recommendations for Stroke Survivors⁸³

In addition to these guidelines that are specific to the care of patients with stroke or TIA or about the prevention of stroke or TIA, other evidence-based guidelines are also relevant to the prevention of cerebrovascular disease including:

1. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure⁸⁴
2. ACC/AHA/ESC 2006 Guidelines for the Management of Patients With Atrial Fibrillation⁸⁵
3. The American Diabetes Association Standards of Medical Care in Diabetes—2007⁸⁶
4. Third Report of the Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults⁸⁷
5. ACC/AHA/Physician Consortium 2008 Clinical Performance Measures for Adults with Nonvalvular Atrial Fibrillation or Atrial Flutter.⁸⁸

1.6 Stroke QUERI Center Clinical Goals

Based on the currently available treatment evidence, current knowledge of VA practices, evidence of quality/outcome gaps, and ongoing VA quality improvement activities, we have established the following three core clinical goals that form the basis of our strategic plan:

- Goal 1: Promote recommended **risk factor management** to reduce the risk of stroke
- Goal 2: Improve **in-hospital management** to reduce stroke morbidity and mortality
- Goal 3: Ensure that veterans with stroke receive appropriate and timely interventions to promote **rehabilitation and recovery**

Within each clinical goal, we have delineated short, medium, and long-term goals as reflected in the Table below and in our Pipeline Diagram. These goals reflect specific projects or other activities necessary to continue to make progress in our major clinical goals and further reflect our commitment to improving stroke care in focused areas that reflect the clinical continuum of care from prevention, to acute care, through recovery from stroke.

As described previously, the care of patients with cerebrovascular disease is complex and requires a multidisciplinary approach across multiple care providers and settings. We remain committed to improving the quality of care across the clinical continuum from prevention, through in-hospital care, to stroke recovery and so focus our clinical goals and workgroups to ensure that we are progressing through the six-step QUERI process to improve care in each of these three foci.

Within our three main clinical foci, we prioritize work based on: 1) the burden of stroke and stroke risk factors in the veteran population, 2) the level evidence for specific interventions; and 3) the greatest gaps within the provision of VA stroke care. We explicitly review our prioritization and goals with our Executive Committee biannually. We are also conducting formal modeling exercises to further inform the strategic prioritization of efforts to improve stroke care in the VHA.

Clinical Goal No. 1: Promote recommended risk factor management to reduce the risk of stroke

Within our risk factor modification focus, our ultimate aim is to develop programs in primary and secondary prevention to: 1) identify veterans at highest risk of stroke, and 2) provide effective risk factor management programs tailored to the veteran's individual stroke risk factors. We have currently prioritized the treatment of hypertension (the single risk factor with highest population attributable risk for stroke) and the evaluation and treatment of multiple vascular risk factors (recognizing the reality of multiple medical conditions in veterans at risk for stroke) in our goal to reduce the risk of stroke among veterans (primary and secondary prevention). This work began with pilot studies to refine individual components of risk prediction and communication, or to develop specific elements of self management programs targeting risk factor modification. Currently, we have several implementation projects in the field in pilot, multi-site, or regional demonstrations in hypertension and multiple risk factor management, and we plan to continue refining and implementing these interventions in future regional and national implementation projects. Some of the work to improve secondary stroke prevention also takes place in the context of in-hospital management, as we seek to improve inpatient quality indicators including treatment of hyperlipidemia and atrial fibrillation (see below). We are also conducting important work to further identify veterans at highest risk of stroke via an RRP using electronic medical

record data to generate stroke risk prediction models for first and recurrent stroke among veterans.

We expect that future projects will increasingly incorporate management of atrial fibrillation, both in primary and secondary stroke prevention. This risk factor is less prevalent but is highly associated with increased stroke risk, has a strong body of evidence guiding treatment decisions, and demonstrates known gaps in best practices within VA. We further expect that the THINRS trial is likely to yield results with significant practice implications for VHA, so we plan to build on these results in FY09, formally exploring next steps among our investigators, other related QUERI groups, and VA offices including PCS and OQP.

Clinical Goal No. 2: Improve inpatient stroke care quality to reduce stroke morbidity and mortality

Within the in-hospital domain, we prioritize improving in-hospital stroke processes of care based on existing evidence and national programs promoting measurement of inpatient stroke quality indicators, the relatively high volume of in-hospital stroke in VAMCs (nearly 6,000 admissions annually), and the absence of other work within VA to improve inpatient stroke care. In prior years, inpatient care quality was evaluated with the FIM performance measure and the QUEST project. In FY08, the OQP Stroke Special project evaluated inpatient care across the VA system. These data will serve as foundational evidence as we further expand efforts to improve inpatient care and identify areas for new implementation efforts. We intentionally worked simultaneously to develop a stroke toolkit, available nationally to clinicians and administrators inside and outside the VA, so that the provision of the first stroke quality data in VA would be accompanied by VA-specific tools to use to improve care. With the expected release of facility-level OQP data in 2009, we have launched a national Stroke Quality Improvement Network (SQUINT), led by co-Clinical Coordinator Dr. Hershey. The aim of this network is to increase conversation and engagement with the field around measuring and improving stroke care, focusing first on inpatient care but broadening across the clinical continuum as we identify risk factor management and rehabilitation care gaps in further OQP analyses. Our long-term goal in this area is to identify, test, and promote the ongoing measurement of key inpatient stroke quality indicators. We are laying the foundation for this effort with the OQP data benchmarking, by developing a decision support system to prompt best practices and provide documentation of these processes (SQUIDSS project), and by planning with OQP for remeasurement of stroke quality indicators in FY10.

Clinical Goal No. 3: Ensure that veterans with stroke receive appropriate and timely interventions to promote stroke recovery

Our aim in this domain is to improve access to post-stroke care that promotes optimal stroke recovery. As such, we are focusing on the area of access (via telehealth and cost-effectiveness of various systems of care) and post-stroke depression. This prioritization is based on evidence that high-quality rehabilitation results in improved patient outcomes, and the reality that veteran stroke survivors and their families care deeply about their access to rehabilitation services. Further, our focus on PSD reflects the strong body of evidence around the increased burden of this condition post-stroke, the evidence for improving patient outcomes with treatment, and the VAs existing emphasis on depression screening among all veterans. We have developed and are currently testing in a 2-site study a stroke-specific depression screening reminder, deployed in primary care and neurology clinics to target depression screening during the first 6 months post-stroke. As this study is completed in FY09 we plan to extend this work in a regional test to

promote evidence-based screening and treatment for PSD. Supported by prior RRP, in FY08 we initiated a project evaluating existing VA telehealth technology to promote improved access to outpatient rehabilitation post-stroke. This multi-site project will provide important data about the functional and system impacts of this intervention which, if successful, could improve both the access and the quality of post-stroke rehabilitation broadly across the VA. We continue to work to understand the intersection of cost and quality of rehabilitation via our study of current rehabilitation practices in VA. This ongoing project will help VA identify and prioritize the type of rehabilitation most likely to be cost effective for stroke patients with differing functional levels.

Clinical Goal	Project (active or planned)	Timeline
<i>Clinical Goal No. 1: Promote recommended risk factor management to reduce the risk of stroke</i>		
1a Identify evidence-practice gaps and disparities in hypertension, atrial fibrillation, lipid, and smoking cessation management pre- and post-stroke	OQP, QUEST, STARS RRP	Short
1b Conduct formative research to evaluate barriers and facilitators of using existing tools to deliver secondary stroke prevention services in VA	TOOLS, SQUIDSS	Short
1c Develop models of individual stroke risk and VA stroke systems of care to inform future risk modification efforts	Cheng RRP, Sim Models RRP	Short
1d Partner with PCS, OQP, CHF, and CAD QUERIs to plan response to THINRS trial results	THINRS SDP	Short
1e Develop and evaluate self management strategies to improve risk factor management among veterans	VSTITCH, HTN-Improve, STOP SDP, TOOLS,	Medium
1f Develop and evaluate IT tools to promote improved management of stroke risk factors	SQUIDSS, GoToSleep, HTN-Improve	Medium
1g Ensure all veterans at high risk of stroke receive high quality stroke risk factor modification practices		Long

Short-term: 1-2 years, Medium term: 3-5 years, Long-term: > 5 years

<i>Clinical Goal No. 2: Improve inpatient stroke care quality to reduce stroke morbidity and mortality</i>		
2a Identify evidence-practice gaps/disparities in inpatient care	OQP, QUEST, QUEST RRP	Short
2b Identify characteristics of sites with best inpatient care	Implement FY09	Short
2c Evaluate an intervention to improve the dysphagia screening process	Implementation FY07, FY08	Short
2d Develop and test surrogate performance measurements using VA electronic medical record data	AdminSurrogates, SQUIDSS	Medium
2e Develop and evaluate interventions to improve inpatient stroke care	Implement FY09, SQUIDSS	Medium
2f All VA facilities will have a policy about the use of thrombolytic therapy or the transfer of patients to outside facilities for emergency stroke care	VISN 11 Initiative, SQUINT	Medium
2g All VA facilities will engage in ongoing inpatient stroke quality performance measurement and improvement	SQUINT	Long
2h All veterans presenting within 2 hours of ischemic stroke will have access to thrombolytic therapy either at the VA facility or a nearby non-VA facility	Implementation FY08 and FY09	Long
2i Conduct ongoing national measurement of key inpatient stroke quality indicators	OQP, future SDP	Long
<i>Clinical Goal No. 3: Ensure that veterans with stroke receive appropriate and timely interventions to promote stroke recovery</i>		
3a Identify current practices, cost, and quality consequences in acute and post-stroke rehabilitation practices	OQP, Acute vs. Subacute, Rehab Cost	Short
3b Estimate the differences in outcomes and utilization between VA stroke patients who use only the VA, those who are Medicare only users, and those who are dual users	VA/NonVA Uts-2	Short
3c Identify evidence-practice gaps and disparities in depression diagnosis and treatment post-stroke	OQP	Short
3d Evaluate the use of a CPRS-based PSD reminder to improve depression screening and treatment post-stroke	PSD	Short
3e Determine the effect of telerehabilitation on physical function for stroke patients after discharge to home	Telerehab	Medium
3f Implement the PSD reminder across multiple VA sites/VISNs to improve PSD screening and treatment in heterogeneous VA settings	PSD SDP	Medium
3g Develop models of care to promote evidence-based policy decisions for post-stroke rehabilitation care		Long
3h Implement focused PSD screening nationally		Long

Short-term: 1-2 years, Medium term: 3-5 years, Long-term: > 5 years

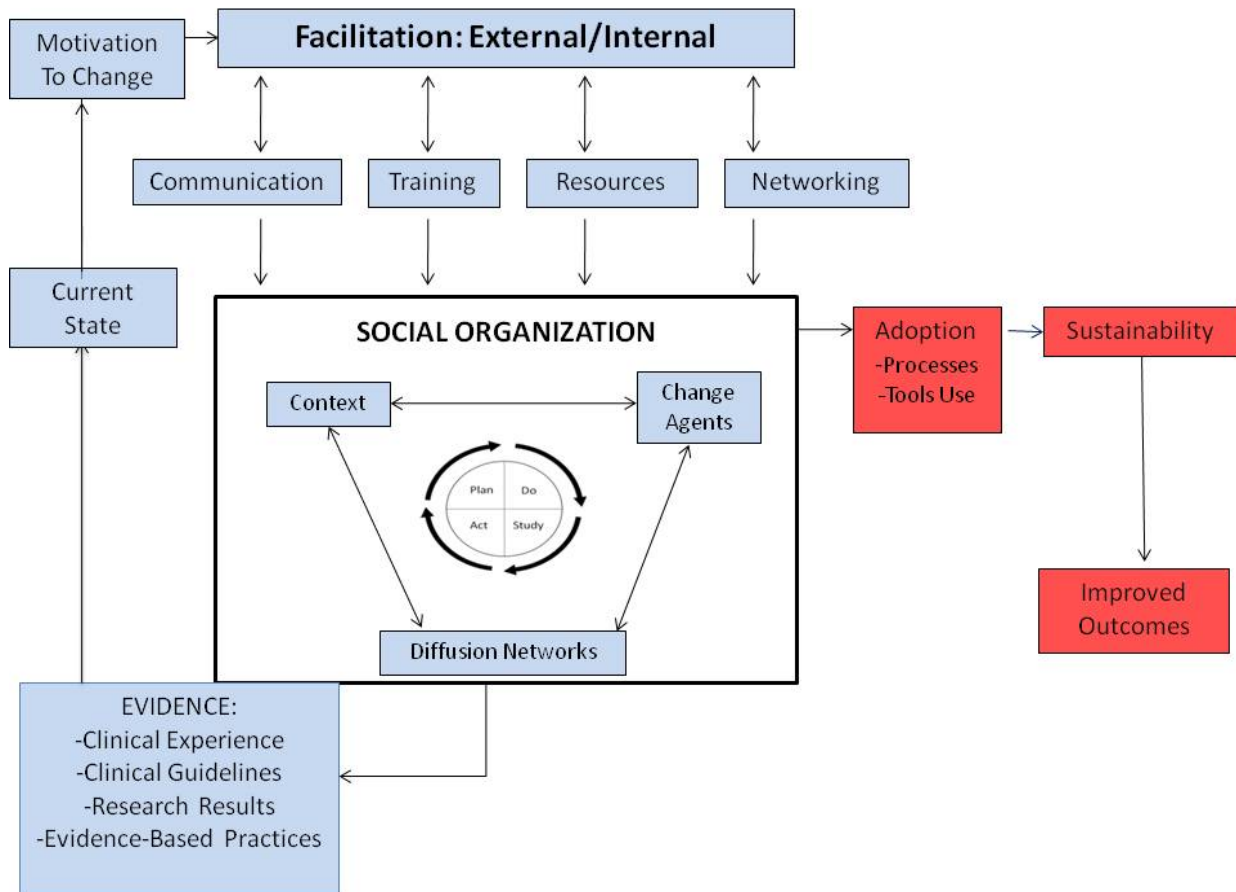
1.7 Plans for Achieving Stroke QUERI Center Clinical Goals

Our plan for achieving our clinical goals uses as a framework the “Facilitating the Adoption of Best Practices (FAB) model we adapted from existing models of implementation and facilitation of evidence⁸⁹⁻⁹¹ as we: 1) develop tools to improve stroke care, and 2) systematically implement these tools into care along the six-step QUERI process model. We also employ other models as they are appropriate to specific projects. For example, many of our projects developing self management programs draw from Wagner’s Chronic Care Model and Lorig’s arthritis self-management work.⁹²⁻⁹⁵ We strategically use pilot funding (e.g. RRP’s, other core funding) to support progress along the six-step QUERI process from identifying additional important gaps in care to conducting pilot implementation activities. To ensure the effective integration of our work into clinical care, we also partner with OPQ, PCS, and other appropriate VHA offices and groups.

The FAB model was a key development activity in FY08 as we sought to bring healthcare engineering and system redesign techniques to specific stroke care quality improvement projects. The model guides the development of strategies across and within organizations to implement and adopt evidence based practices to improve care processes and patient outcomes.

Within a given organizational context, this model considers how external change agents (e.g. QUERI researchers, VA administrators, national organizations) and internal change agents (i.e., front line VA providers) influence the social organization of health care practices to promote and sustain best practices to produce improved outcomes for patients. Using existing evidence (including external evidence and current practices in the organization) and considering motivations for change, external change agents work with the organization to facilitate the desired change. This model identifies key domains impacting this facilitation, thus laying the groundwork for developing interventions to stimulate improvement activities as well as promoting research that evaluates these domains and their influence on adoption and sustainability. Of key importance is the feedback loop from the Social Organization to inform Evidence. As in our previous work on post-stroke depression (PSD), secondary stroke prevention (TOOLS), and the VISN Stroke Collaborative, this loop feeds our VA stakeholders clinical results and experiences back to the level of Evidence for VA clinicians and administrators to consider. Our implementation goals reflect our ongoing work to measure key elements of the model and to evaluate this model in active implementation projects. We also have explicitly identified in each project abstract the elements of the FAB model that we are evaluating within that project.

Figure. FAB (Facilitating the Adoption of Best practices) Model



Our implementation science goals are given in the Table. These goals reflect our cross-cutting themes of using IT tools, system redesign, and self-management strategies to improve care. We work toward achieving these goals in each of our three major clinical foci through ongoing research as well as key partnerships and service activities.

We continue to work in each of our clinical areas of focus in the development and evaluation of IT tools for improving care. Example of tools being developed and evaluated include: a computer software package that facilitates nurse based lifestyle counseling to improve patient self-management of hypertension (HTN IMPROVE), CPRS based tools prompting depression screening (PSD) and best practices in stroke risk factor management (STOP), a telehealth application to promote access to rehabilitation, and a stroke quality improvement support system (SQUIDSS) to serve as a national CPRS tool to improve in-hospital stroke care and provide electronic documentation of stroke care processes. As we develop and evaluate these tools, we then bring the tools as a stroke-specific resource into our facilitation model for improving care, working within the appropriate clinical context to facilitate improved stroke care.

Stroke QUERI Implementation Science Goals	
1.	Develop, implement, and evaluate innovative tools to facilitate the adoption and sustainability of evidence by VA clinicians within the VA system (Resources domain)
1a.	Develop, implement, and evaluate information technology tools to facilitate adoption and Sustainability of best practices
1b.	Develop, implement, and evaluate self-management tools to facilitate adoption and Sustainability improved patient outcomes
2.	Identify and test health care system redesign strategies for improving practices (Facilitation and social organization domains)
2a.	Examine the influence of internal versus external facilitation on practice change
2b.	Identify the influence of the change agents of the innovation on adoption of practice improvement
2c.	Determine key contextual variables influencing the adoption of practice improvement
3.	Evaluate methods for displaying and disseminating quality improvement data to the field (Evidence domain)
3a.	Increase awareness of the relevant evidence among VA clinicians providing stroke care
3b.	Evaluate methods for displaying and disseminating quality improvement data to VA stakeholders

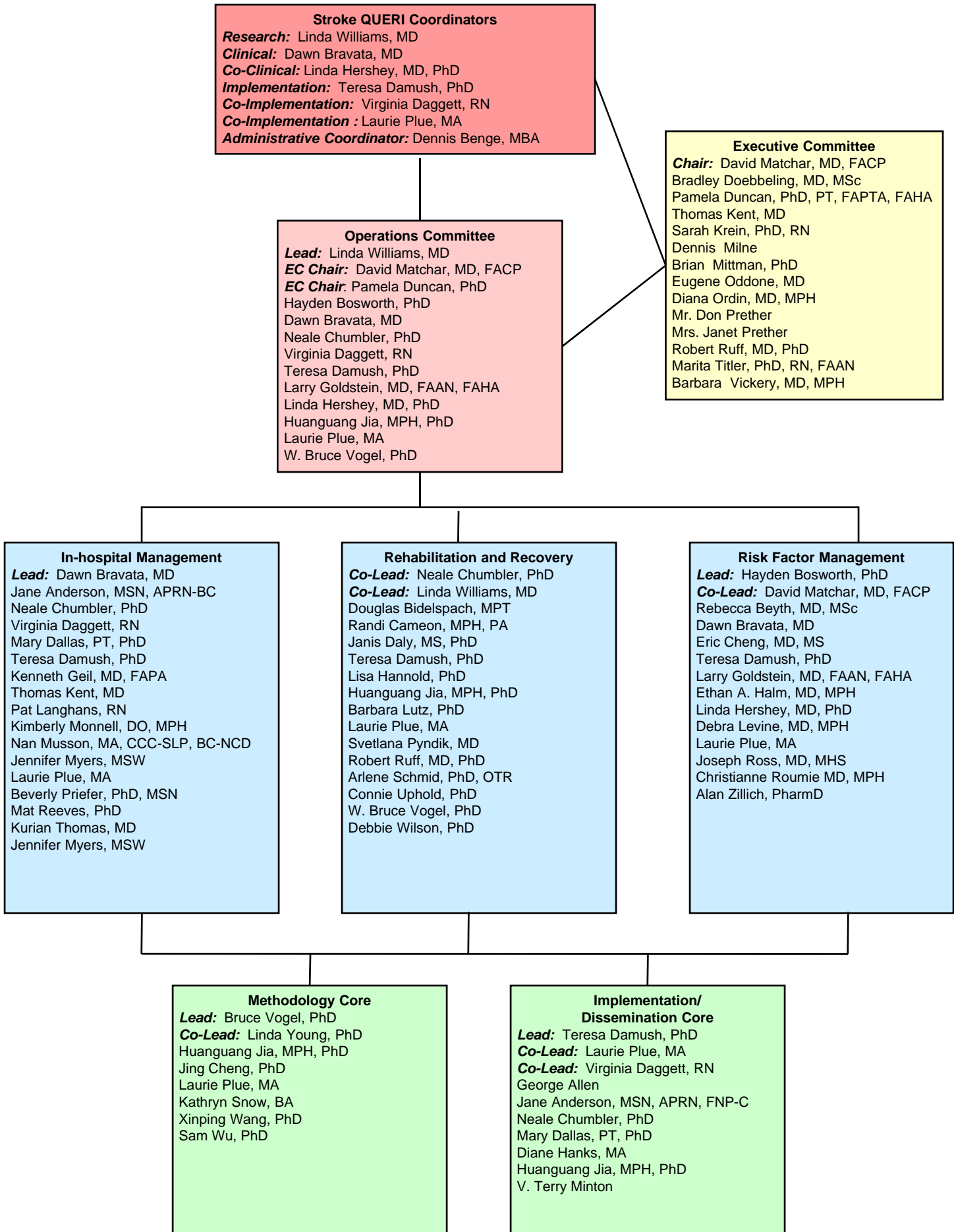
Recognizing that most patients at risk or surviving stroke have multiple stroke risk factors, each with significant behavioral influences, we also focus on the evaluation of innovative self-management tools to improve veterans' ability to self-manage stroke risk factors and post-stroke symptoms. Strategies include the use of group visits and self-management programs for stroke risk factor management for primary and secondary prevention. As we test these tools, we then similarly utilize our implementation model to introduce the tools as a resource within a given clinical context to promote improved stroke care as we move through the QUERI six-step process from tool development and pilot testing to regional or national roll outs.

In addition to tool development and testing, the Stroke QUERI is dedicating efforts to testing healthcare system redesign strategies to facilitate improving practices and to add to our knowledge about how these strategies can be used to facilitate quality improvement as described by the FAB model. In risk factor management, we are evaluating the change agents and context influences on the adoption of locally tailored tools (TOOLS) and a nurse based lifestyle modification program (HTN IMPROVE). In hospital management, we are evaluating the external facilitation strategy of coaching change agents across facilities to implement stroke care processes, moving along the QUERI six-step process from dysphagia screening in two facilities, to multiple in-hospital stroke quality indicators in VISN11. We plan to move our successful VISN11 Stroke Initiative to regional implementation in FY09 in as we extend this model to multiple sites in our FY09 implementation project.

Finally, as a result of our growing body of work measuring stroke care quality, we are focusing attention on evaluating methods for displaying and disseminating quality improvement data to the field through two large initiatives. First, in collaboration with the Office of Quality Improvement (OQP), we have designed reporting templates to provide VA facilities with stroke quality performance data and will evaluate its usability and acceptance in the field in VA. As an outgrowth of the VISN 11 Stroke Initiative and our OQP Stroke Special Project, we are collaborating with OQP and PCS to launch the SQUINT stroke quality network to disseminate evidence to the front line providers of stroke care in VA and foster communication with the field on stroke quality improvement efforts. These activities are examples of the feedback cycle of

disseminating evidence to promote improved care and evaluating evidence from the field to further inform future implementation efforts.

STROKE QUERI ORGANIZATIONAL CHART



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